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The broken broker system?

Transacting on horticulture wholesale markets in India (Uttarakhand)

by

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Abstract

Relying on data from a unique survey, we study the wholesale market activities of agricultural brokers in India. Three main findings emerge. First, most transactions on these wholesale markets are small cash-and-carry transactions with physical handling, quality and quantity assessment, and financial settlements all combined in a single transaction. Second, marketing regulations are ineffective as most brokers charge rates that significantly exceed the prescribed ones. Third, a majority of farmers self-select in long-term relationships with brokers, most often based on their perceived market performance. These relationships allow some of the farmers to interlink credit and insurance markets to the agricultural output market. We find that this inter-linkage does not lead to worse inputs, high interest rates, or lower implicit output prices.

Keywords: India, agricultural marketing, brokers

JEL codes: Q12, Q13, L15

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1. Introduction

Recent research on the traditional marketing system in India concludes that agricultural markets are not efficient (Matoo et al., 2007; Umali-Deininger and Deininger, 2001), lack integration (Palaskas and Harriss-White, 1996), are plagued by collusion (Banerji and Meenakshi, 2004) and are characterized by a high level of wastage (Matoo et al., 2007). To understand the reasons why these inefficiencies arise, it appears crucial to better understand the institutional organization of these traditional markets. Two key characteristics are the role played by so-called “brokers”, which are agents which are widely present in Indian markets to facilitate sellers to find buyers through the organization of auctions, and the often extensive government regulation of market transactions. Furthermore, heavy regulations induce buyers and sellers to avoid some of these transactions and to misrepresent the actual details on agricultural trade. This makes it difficult to obtain truthful data.

In a detailed case study on wholesale markets in the northern state of Uttarakhand in India, we look at the role of the broker in horticultural market transactions. The contributions of our research are twofold. First, we rely on a unique survey design to get at the true picture. We collected primary data with farmers and retailers that just completed a transaction on the wholesale market. Through their answers, we are able to piece together information on effective practices of brokers, which they would not have revealed themselves. The results show that regulations on prices and prescribed commission rates in these markets are largely ineffective. This is an important finding as there is increasingly a debate in the country where some people argue for the importance of regulation of wholesale markets (e.g. Shiva, 2007). These proponents assume that the regulation delivers in practice what it states to deliver in theory.

Second, we collected not only information on broker practices in agricultural output markets but also on markets for credit and insurance and we are thus able to link broker activities to services delivered in these interlinked markets. There is a vast literature on interlinking and it has been argued that such inter-linkage might often lead to exploitation of farmers (e.g. Crow and Murshid, 1993; Basu, 1986; Bell, 1988). We find, consistent with the previous literature on inter-linkages (Bell, 1988; Basu, 1986), that brokers subsidize interest rates on advances but in contrast with this literature, we do not find that this leads to lower implicit output prices. Brokers thus seem to use these inter-linkages as to tie the output of the farmers to them and they seem to have enough rents under the existing regulated market system to pay for these costs.

The structure of the paper is as follows. Section 2 gives background information on the functioning of agricultural markets in India. In section 3, we give an overview of the data and methodology used. In section 4, we look at the results and discuss consecutively the nature of transacting on horticulture wholesale markets, the effects of market regulation, and the role of relationships and market inter-linkages. We finish with the conclusions in Section 5.

2. Wholesale markets, brokers and regulations in India

At the time of India's independence, agricultural marketing was perceived to be badly organized, leading to low prices for the producer, large physical losses, and high marketing costs. A large number of regulations were thus put in place—including controls on private storage, transport, processing, exports, imports, credit access, and market infrastructure development, as well as small-scale reservation of selected enterprises—to ensure a reasonable income for farmers as well as affordable prices for consumers (World Bank, 2007).

One of the government's interventions was to regulate agricultural markets through Agricultural Produce Marketing Committees (APMCs) and to establish a large number of market yards (Acharya, 2004). While some have argued that the regulated marketing

system has served farmers well over time (Acharya, 2004), this view is now increasingly questioned due to several problems with the regulated system. These include farmers being prohibited from buying outside the market yard, the large area served per market yard, the increased importance of bureaucrats in the management of the APMCs, the creation of barriers to entry for newcomers, and the use of market fees as a source of income for the government (Archarya, 2004).

Wholesale markets (*mandis*) numbered 268 at Independence. It is estimated that there were around 6,300 wholesale markets in India in 2007 (Chauhan, 2008). Acharya (2004) estimates that 98% of these markets were in some way “regulated” in 2004. There are also a large number of rural primary/temporary markets (20,870), which might supply wholesale markets located in urban centers. While farmers might have the option—depending on regulation and on the enforcement of this regulation—to go through local village traders, who might be independent or who might work for specific commission agents in the wholesale markets, Fafchamps, Vargas-Hill, and Minten (2008) find that the majority of non-staple foods is sold directly to brokers or traders on the wholesale markets by the rural producers themselves, even in cases where the law does not require them to do so. Sub-wholesalers, who buy on the wholesale markets but do not sell to consumers themselves, or retailers, who do sell directly to consumers, buy produce on these wholesale markets. The latter then distribute these products by pushcarts, in kirana stores, or at wet markets to urban consumers.

Typically, farmers bring their produce to the wholesale market and to the shop of the broker with whom they would like to work. Buyers then pick the produce up from there. Transactions take place mostly by means of an open-outcry auction, managed by a broker who does not take possession but rather just takes commission (therefore called a “commission agent”).² As lots are auctioned, new prices are set. The scant recent research on these traditional marketing systems indicates that these markets (1) are not efficient (Matoo, Mishra, and Narain, 2007; Ramaswami and Balakrishnan, 2002; Umali-

² Unfortunately, no statistics exist on either their geographic coverage or the percentage of crops they handle compared to the wholesaler who takes possession.

Deininger and Deininger, 2001; Thomas, 2003), (2) lack integration (Palaskas and Harriss-White, 1996), (3) are plagued by trader collusion (Banerji and Meenakshi, 2004), and (4) are characterized by a high level of physical wastage (Matoo, Mishra, and Narain, 2007). It has also been found that the wholesale market infrastructure for staple as well as non-staple crops is not very developed (Fafchamps, Vargas-Hill, and Minten, 2008). The majority of wholesale markets are not paved, and there are few grading or cold storage facilities. Sanitation facilities are largely deficient, with few public toilets, inadequate drainage, and little or no coordinated pest control. As can be expected, postharvest losses are rather large in this trading environment.

Agricultural marketing within a particular state is regulated by the Agricultural Produce Marketing (APM) Act, and variation exists between the states in terms of the extent to which the act is implemented. If it is implemented, an APMC is responsible for enforcing the act for each market area. Although more than half the members of this committee were representing the farmers of the market area at the start of the regulated market system, elections have not been held regularly, and committees are now often administrated by bureaucrats (Acharya 2004). The committee is empowered to establish markets, control and regulate the admission of traders to the market, charge fees (market, license, and rental fees), issue and renew licenses, and suspend or cancel licenses. Over time, APMCs have emerged as a government-sponsored marketing-services monopoly that prohibits innovations such as contract farming and does not allow traders to buy outside the specified market yards (Acharya 2004). While the APMC also collects significant revenues from market fees, the infrastructure in most markets is largely deficient, as revenues are often directed toward other ends by the government (Umali-Deininger and Sur 2007; Fafchamps, Vargas-Hill, and Minten 2008).

Under the APMC marketing system, it seems that the bulk of trade in agricultural commodities takes place at the wholesale market, run and operated by the APMC. The committee allots shops to desirous agents who meet basic eligibility criteria (based on nationality, solvency, and other not particularly restrictive criteria) upon payment of a (rather small) license fee. Typically, the number of license holders greatly exceeds the

number of shops available in the yard of the typical wholesale market. Legally, such license holders have equal right to transact business, but effectively the lack of space for trading often severely curtails their business. Licenses once awarded can be easily renewed annually. Invariably, members of the same family transact business at the same shop, which is passed from one generation to the next. Since the number of physical shops is practically fixed and holders rarely return licenses, the advantage enjoyed by license holders who have secured a shop at a given rate is often only reinforced over time.

Given the perceived problems with the existing regulated agricultural market system in particular, the central government, in consultation with state governments and the private sector, formulated an Amended Act, which was circulated to the states in 2003. The Amended Act proposes removal of the restriction of farmer direct marketing (under the regulated system, notified products can be sold only at markets, to licensed traders), the opening of market infrastructure development to other agencies (especially the private sector), and the establishment of a framework for contract farming. However, this act has not yet been amended by a large number of states; as of the beginning of 2007, of the 28 states in India, 11 states had amended the original act and 14 had not, while 2 had never had the original act in place and 1 (Bihar) repealed it (Chauhan 2008).

3. Data and methodology

The nodal point in agricultural marketing in India is the wholesale market as the majority of marketed produce passes through it (Fafchamps et al., 2007). The major aim of the survey that we conducted is to better understand the activities on these wholesale markets for fruits and vegetables. After initial assessments it was felt that wholesalers and brokers were no reliable sources of information as their statements were in strong contrast with those of the persons that they interacted with. It was thus decided to interview farmers and petty retailers that just completed transactions on these wholesale markets and piece together the functioning of brokers based on the interviewees' declarations. Given that

none of the interviewees had apparent incentives for lying, we believe that we obtained a more truthful picture that way.

A survey was conducted in December 2007 on the two main wholesale markets of Uttarakhand, the wholesale market of Dehradun and the wholesale market of Haldwani. The survey focused on the vegetables cauliflower and green peas. At the time of the survey, these were the two vegetables that were being marketed in large amounts in the areas around Haldwani and Dehradun. A total of 480 surveys were conducted of which 240 on the Haldwani wholesale market and 240 on the Dehradun wholesale mandi. The study was set up in such a way that half of the surveys were conducted with farmers and half of them with retailers and that half of the agents were involved in green peas and half of them in cauliflower. Farmers and retailers were both randomly selected. Farmers were interviewed on the wholesale market while retailers were interviewed on the major retail markets of the city.

The survey contained detailed questions on the demographic background of the interviewees, the reasons for the choice of the marketing channel and the broker, and on linkages with the broker used in the last transaction of cauliflower or green peas. Then, information was asked on the last complete transaction, including prices and costs, quality characteristics of the product, quality and quantity assessments by buyers, and the transactions costs incurred in the last transaction. The survey finished with questions on wholesale market practices in general.

We start with descriptive statistics on the farmers and retailers who participated in the survey (Table 1). There is little difference with respect to demographics between farmers and retailers. While farmers are slightly older (47 years versus 37 years for retailers), the level of education and the size of the households are similar. About 40% of them are member of a scheduled caste, tribe, or other backward caste. Farmers seem slightly poorer than retailers: 29% of them carry a BPL (Below the Poverty Line) and 65% an APL (Above the Poverty Line) card.³ This compares to 30% and 51% respectively for

³ Distributed to poorer households by the government as to allow them cheaper access to basic necessities.

retailers. On the other hand, while 47% of the farmers own a mobile phone, this is only as high as 25% for the retailers.

Apart from green peas and cauliflower, the majority of farmers and retailers also sell other agricultural products. 83% of the farmers sold other products over the year and 85% of the retailers sold another product over the last two weeks. The two products do however have a large importance for these agents: It makes up 75% of the annual monetary income of farmers and represents 41% of the turnover of retailers over the last two weeks. Both have similar experiences in dealing with the product under study. As could be expected, farmers and retailers differ in the frequency of interactions on the wholesale markets. Retailers visit almost every day while farmers came on average 23 times a year. Few farmers (16%) and retailers (2%) visit other markets.

Table 1: Descriptive statistics

		Unit	Farmers		Retailers	
			Avg or %	St. Dev.	Avg or %	St. Dev.
Demographics						
Age		years	47.2	10.4	37.3	9.8
Level of education		years	5.3	4.1	4.8	3.4
Household size		number	8.0	3.0	7.0	2.3
Member of scheduled or backward caste/tribe		%	37		39	
Wealth						
Has a BPL (Below the Poverty Line) card		%	29		30	
Has an APL (Above the Poverty Line) card		%	65		51	
Own mobile phone		%	47		25	
Land owned		begha ($\approx 1/15$ ha)	19.0	23.0		
Own tractor		%	29			
Own cattle		%	88			
Product characteristics (cauliflower, green peas)						
Average sales	both products	kg per day			36.2	31.7
	cauliflower	kg per day			28.3	16.1
	green peas	kg per day			44.2	40.3
Average production	both products	tons per season	15.4	18.1		
	cauliflower	tons per season	25.4	18.9		
	green peas	tons per season	5.5	10.0		
Sell other products	both products	% yes			85	
Importance in monetary income	both products	avg %	75.2	23.9	41.3	30.3
Experience with...	both products	years	12.6	10.9	11.6	8.3
Land cultivated of...	both products	begha ($\approx 1/15$ ha)	21.5	23.5		
	cauliflower	begha ($\approx 1/15$ ha)	23.1	20.8		
	green peas	begha ($\approx 1/15$ ha)	20.0	25.9		
Marketing behavior						
Distance to wholesale market		km	42.1	34.8	3.5	2.1
Visits on this market		visits last 2 weeks			10.0	3.4
		visits this year	23.5	18.7		
Time spent on the market		hours	3.5	2.2	2.3	1.0
Visit of other mandi		%	16		2	

4. Results

4.1. The nature of transacting

We distinguish four operations in an agricultural marketing transaction on the wholesale market, i.e. physical handling, quality assessments, quantity assessments, and financial settlements. They are discussed consecutively.

(a) Physical handling

The farmers face physical handling and transaction costs to assure that their produce can be sold on the wholesale market. First, farmers transport their produce to the market and have to bear the cost for this. The large majority of farmers (94%) use motorized transport to do so. Little aggregation takes place at the village level as only 38% of the farmers also bring produce of other farmers when they travel to the market. Except for those farmers that own means of transport, the transport has usually to be paid for and amounts, on average, to almost 10% of the price that is fetched on the wholesale market.

Second, the farmers face opportunity costs for this physical handling as well as for assisting at the auction. The average farmer spends almost two hours to travel to the market and another two hours to go back as well as 3.5 hours on the wholesale market itself. In total, an average farmer reports to spend 7.5 hours to conduct an agricultural transaction that is valued on average at about 75 \$. Combining broker costs, transport expenses, and opportunity costs of time (valued at local wage rates), farmers face transactions costs that are estimated to amount to between 25% and 38% (for green peas and cauliflower respectively), on average, of the price paid by the retailer on the wholesale market. The major contributor to this margin is the transaction cost on the wholesale market itself (as discussed in the next section).

(b) Quality assessments

The large majority of retailers believe there are quality differences between the different lots (Table 2). 83% of the retailers report to have enough information on quality before placing the bid or doing the transaction. 85% of the traders reported to check the quality. To assess the quality, traders rely exclusively on inspection themselves. Quality was checked mostly by looking and touching the produce. One third of the retailers reported to even have tasted the produce. While only part of the produce could be checked in most transactions, almost all retailers believed that the checked sample was representative.

While modern markets and especially international markets put a high premium on food safety, this is seemingly less the case in these traditional horticulture markets. The use of modern inputs is high in horticultural production in India but there is currently little or no transmission in the marketing system for information on the use of inputs (Fafchamps et al., 2008). However, there might be important public health issues related to the lack of proper attention and control of these (Umali-Deininger and Sur, 2007).⁴ In our sample, only one fifth of the retailers stated that they were aware of the production activities on pesticide, fertilizer, and irrigation water use by the farmers. However, even if they are aware, this does not imply that they do not sell unsafe food. Recent research in India shows that there is no price premium attached in traditional markets for these unobservable quality characteristics (Fafchamps et al., 2008).

(c) Quantity assessments

To correctly assess quantities, lots should be weighted. 80% of the farmers and 73% of the retailers say that they know the exact weight of the lot (Table 2). Weighting methods are old-fashioned as only about one-third of the weighing transactions were done on an electronic scale. When produce is weighted, farmers and traders still complain about

⁴ For example, Marshall et al. (2003) tested fresh vegetables in different production sites and in the main wholesale market in Delhi. They found that 72% of the spinach samples exceeded the Indian Maximum Residue Levels (MRL) and 100% exceeded the Codex MRL level. Kumari et al. (2004) found that 26% of their samples of seasonal vegetables contained residues above the MRL levels.

‘rounding off effects’, i.e. where only whole amounts of kgs are paid for. This practice was mentioned by 88% of the farmers and 86% of the retailers. The advantage of the rounding off was in most cases towards the broker or the buyer.

For the buyers to correctly value lots, their expectations on the wastage level in the lot should be well-informed. If buyers are not able to do this correctly, they might charge uncertainty premiums that are passed through to the farmers. About one third of the buyers state they do not know the wastage very well of the lot that they will purchase. 9% says that they do know exactly while the majority (57%) knows it approximately (Table 2).

Even when no weighting takes place, farmers and retailers might still feel comfortable with traditional units that are in vogue. Only 22% of the retailers reported that they were not satisfied with the assessment of the quantity. While a large majority of the traders thus seem to have enough information to make a reliable quality and quantity assessment of the lot, there is however some distrust towards the existing system as illustrated by the asymmetric responses by farmers and retailers towards rewards and payments for quality and quantity. About two thirds of the farmers believe that they sometimes deliver higher quality and quantity than they are paid for while one quarter or less believes that they deliver lower quality and quantity than paid for (Table 2). The complaints are similar, but in the opposite direction, for retailers.

(d) Financial settlements

Payments for the transactions are in most cases immediate and in cash for farmers as well as retailers. 82% of farmers state that they are paid within three hours after the transaction. The large majority of retailers also report to pay immediately for the transaction. Agricultural trading is largely a cash economy as almost none of the transactions are settled by check or other more sophisticated means of payment. Similar results on the importance of unsophisticated and cash transactions have also been found

in other developing agricultural economies (Fafchamps, 2004; Fafchamps and Minten, 1999; McMillan, 2002).

Table 2: Quality and quantity assessments

	Unit	Quality		Quantity	
		Farmers	Retailers	Farmers	Retailers
Overall					
There are quality/quantity differences between lots					
A lot	%	1	3	1	3
A bit	%	93	92	94	90
None	%	6	5	5	6
It happens that buyer/seller receives/delivers lower quality/quantity than paid for					
Regularly	%	0	0	0	0
Sometimes	%	25	68	19	62
Never	%	74	32	80	38
It happens that buyer/seller receives/delivers higher quality/quantity than paid for					
Regularly	%	5	3	5	3
Sometimes	%	68	52	64	29
Never	%	27	45	31	58
Last transaction					
Buyer had enough information before transaction	% yes		83		78
Quality assessment last transaction					
The buyer checked quality himself	% yes		85		
If not,...					
... how was quality assured?					
No assurance on quality	%		66		
Assurance is based on trust with broker	%		34		
If yes, ...					
... way of quality checking					
by looks	%		100		
by touch	%		62		
by smell	%		7		
by taste	%		34		
... buyer was able to check whole lot	% yes		34		
... if only part of the lot, was it representative?	% yes		90		
The buyer knows about production activities (i.e. pesticide use, irrigation water use, etc.)	% yes		22		
Quantity assessment last transaction					
Seller/buyer knows exact weight of the lot	%			80	73
If weighed, ...					
..., weighed in front of seller/buyer?	%			80	93
type of scale used is					
... mechanical	%			67	73
... electronical	%			33	27
rounding off weights	%			88	86
rounding off weight in seller's advantage	%			16	11
rounding off weight in buyer's advantage	%			84	89
If not weighed,...					
..., differences between standard units?					
A lot of variation	%			0	8
A bit of variation	%			88	83
No differences	%			12	8
Buyer knows quantity of wastage at purchase					
Exactly	%				9
Approximately	%				57
Not very well	%				34

4.2. The effect of regulations

Agricultural marketing in India is regulated through different Acts. Regulation has been deemed important by successive governments as to allow farmers to get the best prices and to avoid exploitation by unscrupulous traders (Acharya, 2004). The most important regulation is arguably the Agricultural Produce Marketing (APM) Act. For each market area, a Committee (APMC) is responsible for enforcing the Act and it is empowered to establish markets, control and regulate admissions to the market; charge fees (market, license and rental fees); issue and renew licenses, and suspend or cancel them. While the APMC collects significant revenues from market fees, the infrastructure on most markets is largely deficient with lack of water provision, covered areas, drainage and appropriate waste disposal (Umali-Deiningner and Sur, 2007; Fafchamps et al., 2007). The existing Act however prevents greater private sector involvement in the construction and operation of wholesale markets. The Amended Act proposes to remove the restriction of farmer direct marketing, opens market infrastructure development to other agencies and establishes a framework for contract farming. However, this Act has not been amended by a large number of states, i.e. as of the beginning of 2007, of the 28 states in India, 11 states had amended the Act, 14 had not while 2 had never an Act in place and 1 repelled it (Bihar).

An important regulation of the Agricultural Produce Marketing (APM) Act in vogue in Uttarakhand states that the broker rates should not be higher than 3% and that 2.5% tax on each transaction is to be paid to the market officials. Both these charges are stated *not* to be paid by the farmer. We test with the data that were collected with farmers and retailers to what extent these regulations are respected. While statements on costs faced by farmers and retailers are informative and confirm already the non-respect of regulations, the real benchmarks are the net payments that farmers receive and that retailers pay when they leave the wholesale market. Figures 1 and 2 show the net prices that farmers received and that retailers paid for the two products studied. First, they illustrate the large price variation for these products over the time of survey, often due to location, quality differences, and the day of the transaction. Second, they show the clear

parallel leftward shift of the net price received by the farmer compared to the price paid by the retailer, reflecting the transaction costs incurred on the wholesale market.

Figure 1. Cauliflower prices

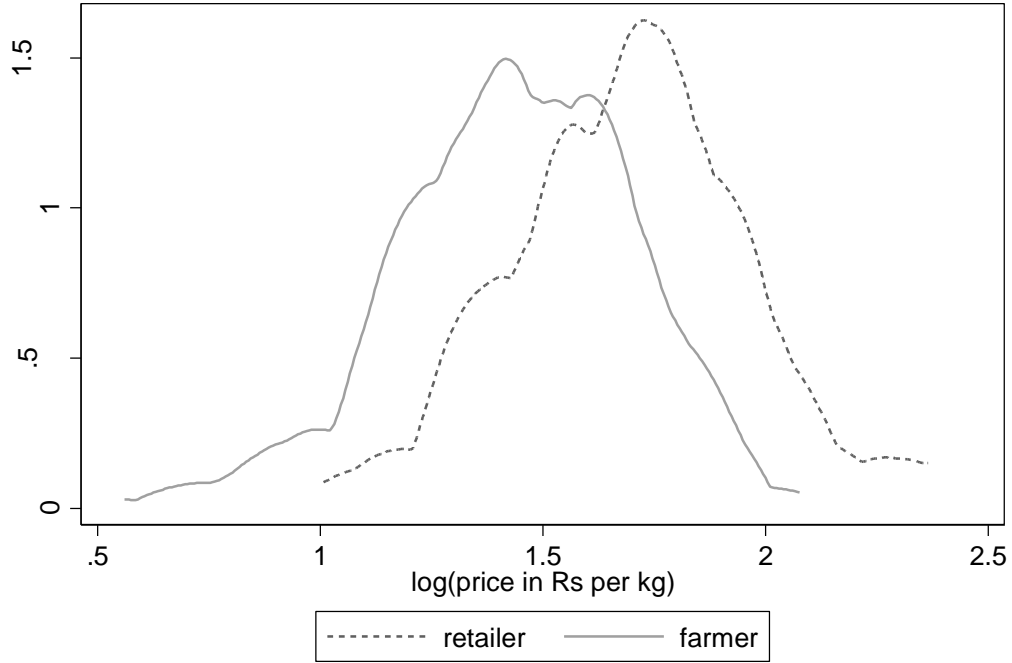
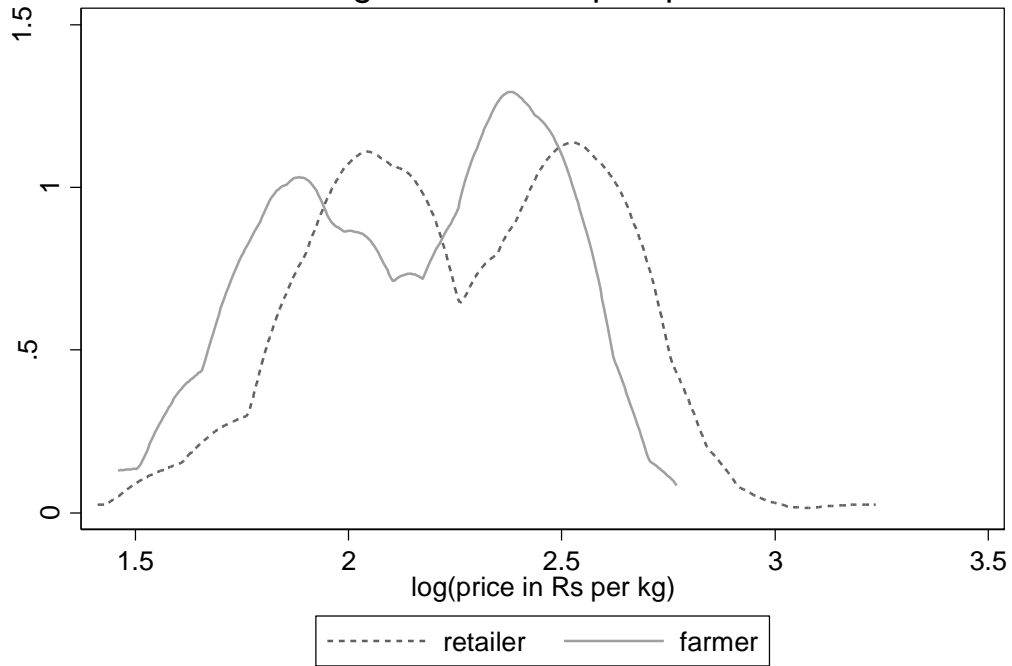


Figure 2. Green pea prices



To formally test for the size of the differences in these net payments, we run a regression where we link the log of the price per kilogram paid by the buyer and received by the seller on a dummy of the retailer and the location of the market. The results are shown in Table 3. They indicate that the price that the retailers pay is significantly higher than the price received by the farmer for both cauliflower and green peas. The difference is as high as 13% in the case of green peas and 26% in the case of cauliflower. As price differences could be explained by other potential determinants such as the quality of the product as well as the day of the transaction, we add these additional controls in the regression (bottom Table 3). The coefficients stay largely significant and the size of the coefficient is robust. For both specifications we use a formal F-test to verify that the price difference between retailer and producer is higher than the prescribed rates (i.e. 5.5%). As we interviewed only farmers and retailers that had a transaction on the wholesale market, the results thus indicate that the margin is significantly higher than the prescribed rates and that marketing regulations on margins are not respected.

Table 3: Determinants of vegetable prices (dep. var. = log(price per kg))

	Unit	Cauliflower		Green peas	
		Coefficient	t-value	Coefficient	t-value
Parsimonious specification					
retailer	yes=1	0.263	9.23	0.127	4.12
Dehradun market	yes=1	0.282	9.91	-0.405	-13.10
intercept		1.296	52.47	2.345	87.54
Number of observations		240		240	
F(2, 237)		91.69		94.25	
Prob > F		0		0	
R-squared		0.436		0.443	
Adj R-square		0.432		0.438	
F-test:					
Price difference between farmer and retailer is higher than prescribed 5.5%					
F(1,239)		53.37		5.48	
Prob>F		0.00		0.02	
Including controls for quality and the day of transaction					
retailer		0.244	8.37	0.128	4.53
medium size	yes=1	-0.128	-3.68		
small size	yes=1	-0.272	-4.67		
mixed size	yes=1	-0.119	-3.13		
number of peas per shell	number			-0.023	-1.48
presence of spots	1=yes	0.067	1.90	-0.015	-0.37
rotten material	1=yes	0.054	1.37	-0.128	-3.05
less bright color	1=yes	0.029	0.68	-0.098	-2.41
Dehradun market		0.308	7.99	-0.469	-14.11
day of transaction included but not reported					
Intercept		1.713	12.39	2.506	20.05
Number of observations		239		236	
F(x, 220)		19.38		24.15	
Prob > F		0		0	
R-squared		0.613		0.622	
Adj R-square		0.582		0.596	
F-test:					
Price difference between farmer and retailer is higher than prescribed 5.5%					
F(1,239)		42.06		6.66	
Prob>F		0.00		0.01	

4.3. Relationships with brokers and market inter-linkage

While there are few marketing options for these farmers and retailers outside the broker channel (partly due to the market regulations), there are however seemingly a large number of choices within this channel. Farmers state they could potentially choose among 60 brokers that deal in the produce that they are selling. Of these brokers, they state to know five personally. However, they would only use a limited number of them for their transactions, i.e. less than 2 on average (Table 4). 57% of the farmers only used one broker for all their transactions of this particular product last year (on average 26 transactions in total). A significant number of farmers thus self-select in a specific broker relationship. Often they have a long-term relationship with this broker as they reported to have dealt with the broker from the last transaction on average for almost 10 years.⁵ An obvious question is then why these farmers self-select in these long-term relationships. Different reasons have been given in the literature on the benefits of relationships in this type of trading environment (Fafchamps and Minten, 1999, 2002). They include among others information sharing, regularity of supply and demand, access to credit, prevention of contractual breach, and risk sharing.

To get at these reasons, farmers and retailers were explicitly asked why they chose the specific broker in their last transaction. While a seemingly non-economic reason such as habit formation is part of the explanation of going through a specific broker (50% and 29% of the farmers and retailers respectively state this to be very important), most of farmers and retailers state that the decision is however mostly based on a perceived reduction of the search costs and on obtaining the best price possible. It is important to note that interlinkages are not the most important reason given and lag behind all other options given. Interlinked market services provided by brokers are especially less important for retailers. Only 4% of the retailers would choose a particular broker because he thinks it very important that they provide the option of access to credit. However,

⁵ Retailers report a similar large number of brokers to choose from but they usually consider a larger number than farmers that they effectively use for transactions.

these numbers are as high as 26% for the provision of input advances and 21% for the provision of credit in the case of farmers.

Table 4: Frequencies of transactions and reasons for the choice of a broker

	Unit	Farmers Avg or %	St. Dev.	Retailers Avg or %	St. Dev.
Frequencies of transactions					
Number of transactions through brokers					
this season	number	9.6	9.7		
last year	number	26.1	27.2		
last two weeks	number			9.0	2.7
Number of brokers used for these transactions					
this season	number	1.6	0.9		
last year	number	1.8	1.2		
last two weeks	number			3.5	2.6
Number of brokers used last season (farmers)/last 2 weeks (retailers)					
One	%	57		17	
Two	%	33		19	
more than two	%	10		64	
Time dealt with the broker of last transaction	years	9.7	9.1	9.2	7.1
% that states this as a "very important" reasons for choosing the broker in the last transaction					
"He finds lots of potential buyers/sellers"	%	46		34	
"He offers better prices"	%	55		64	
"He offers higher quality"	%			66	
"He gives seasonal input advances"	%	26			
"He allows me to defer payment"	%			16	
"He offers loans in case of need"	%	21		4	
"I have the habit"	%	50		29	
"He has quick transactions"	%	63		58	

Relationships with brokers seem further to be little used towards information sharing. Wholesale horticultural transactions are spot transactions where farmers and retailers show up without much prior contacts. 95% and 98% of the farmers and retailers respectively reported that they had no contact with the broker before coming to the market. For those that had contact, only a limited number discussed prices with the broker. Most of the price information for retailers and farmers was obtained informally through personal observations or through contacts with fellow farmers or traders.

It seems that the long-term relationships with brokers, if they are used towards economic purposes, are especially valuable for access to credit and insurance. Given the interest in the literature in this phenomenon (e.g. Bell and Srinivasan, 1989), the potential presence of exploitative relationships because of interlinking (Crow and Murshid, 2003), and the perceived difficulty of modern channels to compete with these informal arrangements

(Reardon et al., 2008), we try to understand the activities of brokers in these interlinked markets better below.

A common problem for rural agricultural economies is the prevalence of different types of shocks for which, especially poorer, households might be ill-prepared. Given the lack of formal insurance mechanisms, households must often rely on social capital and selling of assets to deal with these shocks and only those households that have these informal insurance mechanisms are able to successfully smoothen their consumption (e.g. Rosenzweig and Wolpin, 1993).

Some farmers - and a limited number of retailers - use the broker as a source of insurance (Table 5). 39% of the farmers report that in case of need, the broker would give loans to the farmer for sure. 18% of the farmers think that he would 'probably' do so. While more than half of the farmers think that they could rely on the broker in case of need, only 22% of the farmers have ever received a loan from the broker with whom they dealt in the last transaction. 20% of the farmers received a loan in the last 5 years.⁶ However, farmers seldom rely exclusively on brokers for access to credit as 96% of the farmers report to have alternative sources of credit. These include formal banks (46% of the farmers) but more importantly friends and family (78%).⁷

A second advantage for farmers of working with specific brokers might be the access to seasonal input advances. This access proves often problematic for some - and often the poorest - farmers all over the developing world, often due to seasonal liquidity constraints (Dercon and Christiaensen, 2007). 23% of the farmers received this year an input advance of the broker that they dealt with in the last transaction. For half of the farmers, this advance was in kind, more specifically seeds.⁸ The quality of the seeds was evaluated by most farmers to be good (68%) and almost half of the farmers think that they could

⁶ The average value of the loan was 8263 Rs (more than 200\$) or about twice to four times the value of the last transaction.

⁷ Access to credit through brokers is less important for retailers. Only 7% of the retailers believe that the broker would give loans for sure in case of need and only 2% of the retailers report to ever have received a loan from a broker. Retailers also can rely on other options for access to credit as stated by 95% of the retailers.

⁸ No fertilizer or pesticides were given in kind to any farmer in our sample.

not find the same quality themselves at the same price. On the other hand, they do not believe that productivity of their vegetables was higher because of the use of these inputs. Almost none of the brokers (11%) monitored the use of these seeds. One-third of the farmers reported to have to pay interest on this advance in kind. The other half of the farmers that received input advances, received inputs in cash. Interestingly, only 1 farmer that received this advance in cash was asked to pay interest on it.⁹

We also asked farmers what the broker would do if the farmer would not pay back the input advance. As is usual the case in this type of markets, a formal enforcement mechanism is little relied upon (e.g. Fafchamps and Minten, 2002; McMillan and Woodruff, 1999). Farmers report that it is very unlikely that the broker will go to the market authorities, to the police, or to the court (Table 5). In case of default, he will however not work anymore with this farmer, other brokers will hear about it, and some brokers might use peer pressure in the village.

⁹ Surprisingly, only 6% of the farmers state they would receive every year input advances from this broker. It thus seems that they would have to make the case every year for the need of this money.

Table 5: Credit and input advances

	Unit	Farmers		Retailers	
		Avg or %	St. Dev.	Avg or %	St. Dev.
Access to credit/insurance					
Number of brokers that farmer/retailer could obtain a loan from	Number	1.1	1.1	0.6	1.2
<i>Broker used in last transaction</i>					
The broker gives loans in case of need					
yes, for sure	%	39		7	
probably	%	18		22	
no	%	44		71	
Buyer/seller ever received a loan from this broker	%	22		2	
Number of loans received in the last five years	Number	1.9	1.1	2.4	1.7
The value of the loan - mean	Rs	8263	9429	21500	38464
Buyer/seller has other sources of loans	% yes	96		95	
If yes, from...					
...bank	%	46		17	
...friends/family	%	78		81	
...others	%	2		14	
Access to input advances					
Number of brokers that farmer received input advances from this season					
From none	%	78			
From one broker	%	22			
From two brokers	%	1			
<i>Broker used in last transaction</i>					
Farmers that received an input advance	%	21			
Of those that received input advances, ...					
...input advances were partly in kind	% yes	55			
<i>Details on input advances in kind</i>					
Farmers that received seeds	%	96			
Value of seeds received - mean	Rs	6115	7769		
"Quality of seeds"	% good	68			
"Could have access to market for same quality"	% yes	56			
"Productivity of these seeds is higher than if bought myself"	% yes	22			
"Farmer can find inputs himself at a cheaper price"	% yes	15			
"Broker checks if inputs were used on farmer's fields"	% yes	11			
"Interest payments on this advance"	% yes	33			
...input advances were partly in cash	% yes	55			
<i>Details on input advances in cash</i>					
Amount of cash received - mean	Rs	6982	9546		
"Interest payments on this advance"	% yes	4			
...the farmer receives input advances every year	% yes	29			
...what would happen if these input advances were not paid back?					
"Broker will not work with me anymore"	% yes	84			
"Broker would complain to the market authorities"	% yes	20			
"Broker would complain to the other brokers"	% yes	77			
"Broker would use social pressure in the village"	% yes	55			
"Broker would bring me to the police or court"	% yes	2			

To empirically explore what the determinants are that drive access to credit and input advances from brokers to farmers, we use a Heckman model where we estimate in a first stage the likelihood that a farmer was a beneficiary of a loan for personal needs in the last five years and of input advances in the last season, and then estimate in a second stage how much he received. The distance from the trader to the wholesale market serves as an instrument in the selection equation.¹⁰ The results are shown in Table 6.

Access to loans and input advances are seemingly little linked with need as poorer farmers have equal access to loans as richer ones (as measured by total land cultivated and by having access to a BPL card). Farmers that live further from the market are significantly less likely to receive a loan while farmers that visit the market more often are more likely to receive a loan. Conditional on receiving a loan, farmers who cultivate more land of the vegetable under study, receive significantly bigger loans. A doubling of the area increases loans for personal needs by 50% and the input advances by 43%. This confirms earlier results of Bell and Srinivasan (1989) where they found credit-marketing linkages in India to be stronger in the states where larger farmers dominate.¹¹ These findings seem to indicate that brokers provide this access to interlinked markets rationally and they seemingly do not discriminate against specific castes or against the poor. Brokers are more likely to provide loans to those farmers whom are easier to monitor (as measured by distance from the farmer's village to the market and by the number of visits of the farmers) and who have the payback capacities (as measured by the area allocated to the crop traded by the broker).

¹⁰ Distance to the wholesale market should be a determinant of the costs of recuperating the money in case of default but conditional on receiving a loan, it should not affect the amount of the loan.

¹¹ Crow and Murshid (2003) find in Bangladesh that social power is an important determinant of access to loan and that poorer household get loans but on less advantageous conditions.

Table 6: Determinants of loans and input advances received by farmers (Heckman model)

		Last loan received		Input advances received	
		Coefficient	z-value	Coefficient	z-value
Determinants of log(Amount in Rs)					
household characteristics					
member of scheduled or backward caste/tribe	yes=1	-0.438	-1.03	-0.181	-0.49
years of education	log(number)	-0.024	-0.08	-0.238	-1.40
household size	log(number)	0.019	0.43	-0.062	-1.34
holder of Below Poverty Line (BPL) card	yes=1	0.333	1.28	0.252	0.86
production characteristics					
area cultivated of the studied crop	log(area)	0.501	3.69	0.435	2.98
intercept		7.874	7.59	8.684	8.35
Selection equation					
household characteristics					
member of scheduled or backward caste/tribe	yes=1	-0.245	-0.93	-0.029	-0.12
years of education	log(number)	0.498	3.01	0.061	0.47
household size	log(number)	0.049	1.30	0.030	0.86
holder of Below Poverty Line (BPL) card	yes=1	0.428	1.67	0.391	1.61
production characteristics					
area cultivated of the studied crop	log(area)	-0.080	-0.62	0.082	0.65
market characteristics					
market of dehradun	yes=1	-0.301	-1.12	0.013	0.05
number of visits per year	log(number)	0.388	2.39	-0.036	-0.24
distance to the market	log(hours+1)	-0.746	-3.09	-0.814	-3.33
intercept		-1.449	-2.01	0.218	0.34
Number of observations		237		237	
Censored observations		185		192	
Uncensored observations		52		45	
Wald chi2(5)		16.46		15.43	
Prob>chi2		0.006		0.0087	

With our data, we further do not find evidence of exploitative relationships due to inter-linkages as reported in other settings (e.g. Crow and Murshid, 2003; Rao and Jerome, 2006). First, interest rates are most often not paid for these loans or advances as shown in Table 5. Brokers seemingly subsidize their capital costs for these advances to the farmers. Second, while advances have to be paid back by revenues from the sale, inter-linkage does seemingly not lead to lower implicit product prices. To empirically test this hypothesis, we link the product prices with a dummy on the use of input advances or loans for personal needs in the last five years. We control for the type of product, the day of trade, and quality attributes of the product and run an OLS regression and also a 2SLS regression given potential endogeneity concerns where we instrument the use of credit or input advances by the logarithm of the time needed to travel to the market (Table 7). As expected, a further distance of the market is associated with lower credit or input advance

use. The value of the F-test is significant at the 10% level but is below 10, indicating a problem of weak instruments. Given the presence of weak instruments, we apply the Anderson-Rubin test (Mikusheva and Poi, 2001). This procedure corrects the threshold value for the significance of use of credit/input advances that allows for weak instruments (Bottom Table 7). Both specifications, the OLS and the 2SLS, show there is no significant negative link between the use of credit and prices received by the farmer, implying that there is no evidence that inter-linkage leads to lower prices for the farmer.

We thus find, consistent with the pervious literature on inter-linkages (Bell, 1988; Basu, 1986), that brokers subsidize interest rates on advances but in contrast with this literature, we do not find that this leads to lower implicit output prices. Brokers thus seem to use these inter-linkages as to tie the output of the farmers to them and they seem to have enough rents under the existing regulated market system to pay for these costs.

Table 7: Effect of interlinkage on prices paid to farmers (dep. var=log(price per kg))

		OLS		IV*	
	Unit	Coefficient	t-value	Coefficient	t-value
credit/input advances	yes=1	0.103	2.830	0.694	1.650
product dummy included		yes		yes	
quality indicators included		yes		yes	
date of transaction included		yes		yes	
intercept included		yes		yes	
Number of observations		240		238	
F(22, 217)		29.86		13.69	
Prob > F		0		0	
R-squared		0.752		0.464	
Adj R-square		0.726		0.409	
First-stage regression statistics				F(1,215)	Prob>F
Significance instrument: log(distance traveled)				3.621	0.0584
Anderson-Rubin statistic				Test-value	95% crit. value
				6.45	3.84

*: instrument (logarithm of time required to travel to market)

5. Conclusions

In this paper, we study the widely present broker institution in agricultural markets in India. We find that most transactions on wholesale markets are small cash-and-carry transactions with high transaction costs, that marketing regulations on prices are ineffective, that a majority of farmers self-select in long-term relationships with brokers and that some of the farmers rely on the inter-linked markets to the agricultural output market but that there is no evidence that this inter-linkage leads to worse inputs, high interest rates, or lower implicit output prices.

If regulations allow, it seems that practices by brokers will be increasingly challenged in changing Indian markets driven by more demanding customers and by the emergence of modern market channels.¹² First, one of the characteristics of modern markets is that they often aim to separate out the different processes of physical handling, quality and quantity assessments, and financial settlements.¹³ However, these are all combined in one single transaction of a small quantity of product of heterogeneous quality on wholesale markets in India. Fafchamps and Minten (1999) argue that this can hardly be regarded as an efficient way of conducting trade given that search costs are significantly higher than they should be and large amounts of cash circulate in the countryside, creating problems of insecurity as well as of an inflation tax. Given potential benefits of economies of scale, modern channels might opt to put different practices in place, as has been the case in other countries (Reardon et al., 2003).

Second, regulations have seemingly slowed down the emergence of modern market channels in India (Reardon et al., 2008). For example, regulations in most states prohibit direct purchases from the farmer beyond the regulated market system and there are severe restrictions on foreign direct investments in modern retail. Our results show however that

¹² Modern market channels are growing significantly faster than overall food expenditures indicating their growing importance.

¹³ For example, the large horticulture cooperative Safal which has about 300 retail booths in New Delhi and which procurement system has served as a model for different modern retailers in India, organizes procurement through collection centers in the village, outsources transportation services, relies on farmers association to assess quality and quantity and pays through bank wires.

regulations are significantly different from effective practices on these wholesale markets. This is an important finding as there is increasingly a debate in the country where some people argue for the importance of regulation of wholesale markets and fight against allowing, for example, direct procurement from farmers by modern market channels (e.g. Shiva, 2007). These proponents assume that the regulation delivers in practice what it states to deliver in theory. Regulations seem especially having hurt the emergence of formal businesses in agricultural trade. Increasing deregulation will then probably lead to a faster emergence of alternative modern market channels.

Third, some brokers tie farmers through linkages in credit and insurance markets. It is interesting to find these linkages in traditional markets as there is a trend in modern markets towards more vertical integration, i.e. where companies contract with suppliers and supply inputs, often on credit, as to assure quality (e.g. Swinnen, 2007). However, while the drive for these modern market channels is often to assure quality in the market place, the incentive for brokers to assure inter-linkages in these markets is different as they seemingly want to tie the output of farmers to them (Crow and Murshid, 1993; Bell and Srinivasan, 1989) with little regards for food safety, monitoring of production practices, distribution of quality inputs, or extension of improved technologies, which are typical for these modern markets (Swinnen, 2007).

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